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Chung et al.

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(54) **CUSTOMIZING POSTS BY ACTIVITY TYPE AND CLIENT TYPE**

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H04L 12/58 (2006.01)

(52) **U.S. Cl.**
CPC ***H04L 51/06*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 17/30; G06F 15/16; H04L 51/00; H04L 61/00
USPC 709/204, 219, 246
See application file for complete search history.

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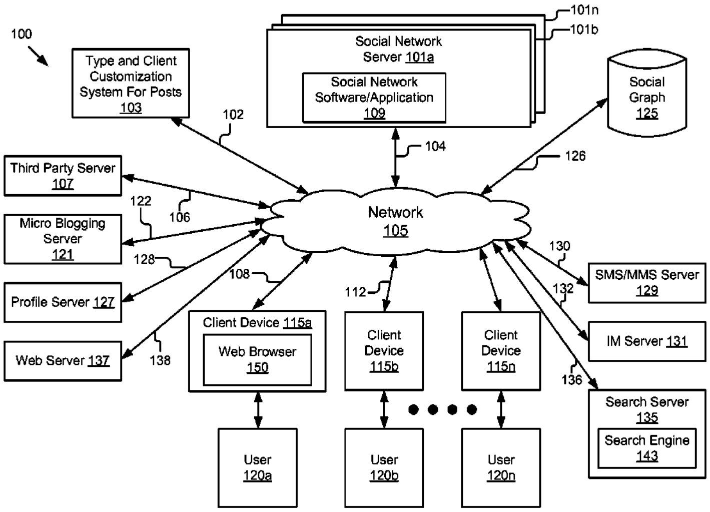
(57) **ABSTRACT**

A system and method for per-client, per-type customizations to posts in an activity stream comprises an extraction pipeline and a rendering pipeline. The extraction pipeline can include a library of embedded code, data type taxonomy and an embed converter. The data type taxonomy is coupled to an activity source to receive activity information, and to produce a first protocol buffer. The embed converter produces a type-specific protocol buffer from the first protocol buffer and embedded code based in part upon the type of activity and the type of client. The type-specific protocol buffer is provided to the client to process activity information or present activity information. The disclosure also includes a method for processing a post in an activity stream on a per-client, per-type basis.

25 Claims, 12 Drawing Sheets



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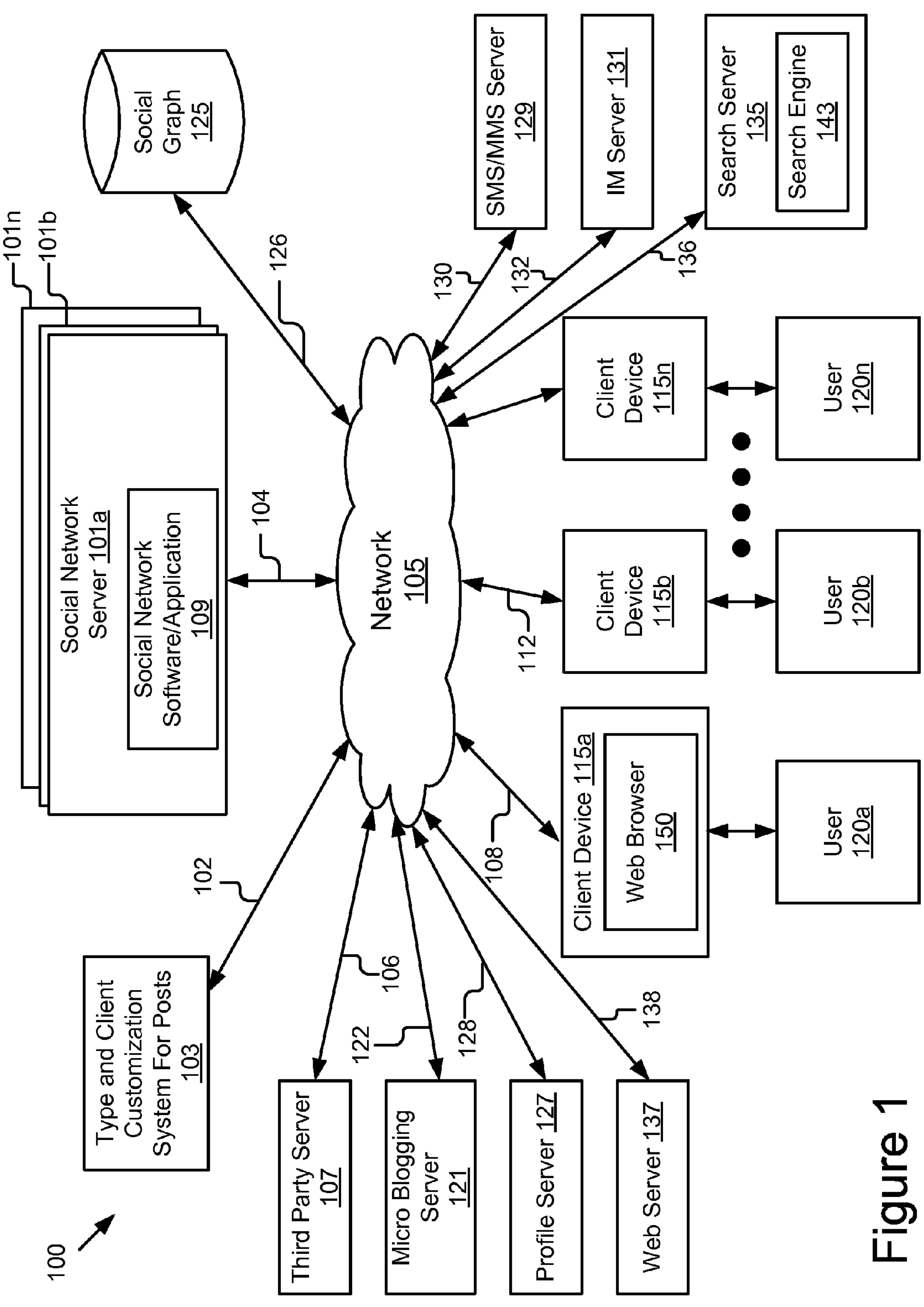

100
101n
101b
Social Network Server 101a
Social Network Software/Application 109
104
126
Social Graph 125
130
132
136
SMS/MMS Server 129
IM Server 131
Search Server 135
Search Engine 143
Network 105
Client Device 115n
User 120n
Client Device 115b
User 120b
112
Client Device 115a
Web Browser 150
User 120a
108
102
Type and Client Customization System For Posts 103
106
122
128
138
Third Party Server 107
Micro Blogging Server 121
Profile Server 127
Web Server 137

Figure 1

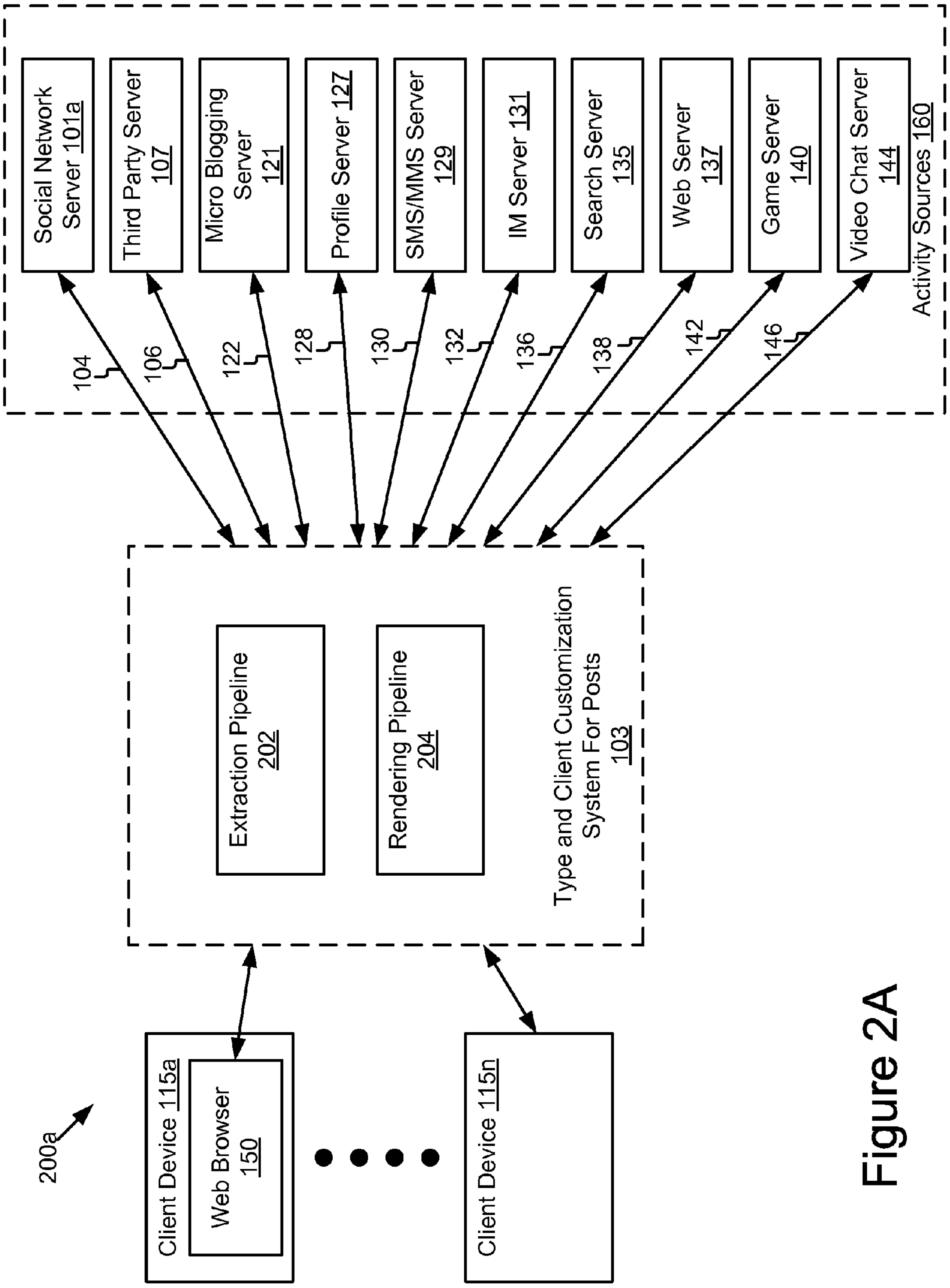
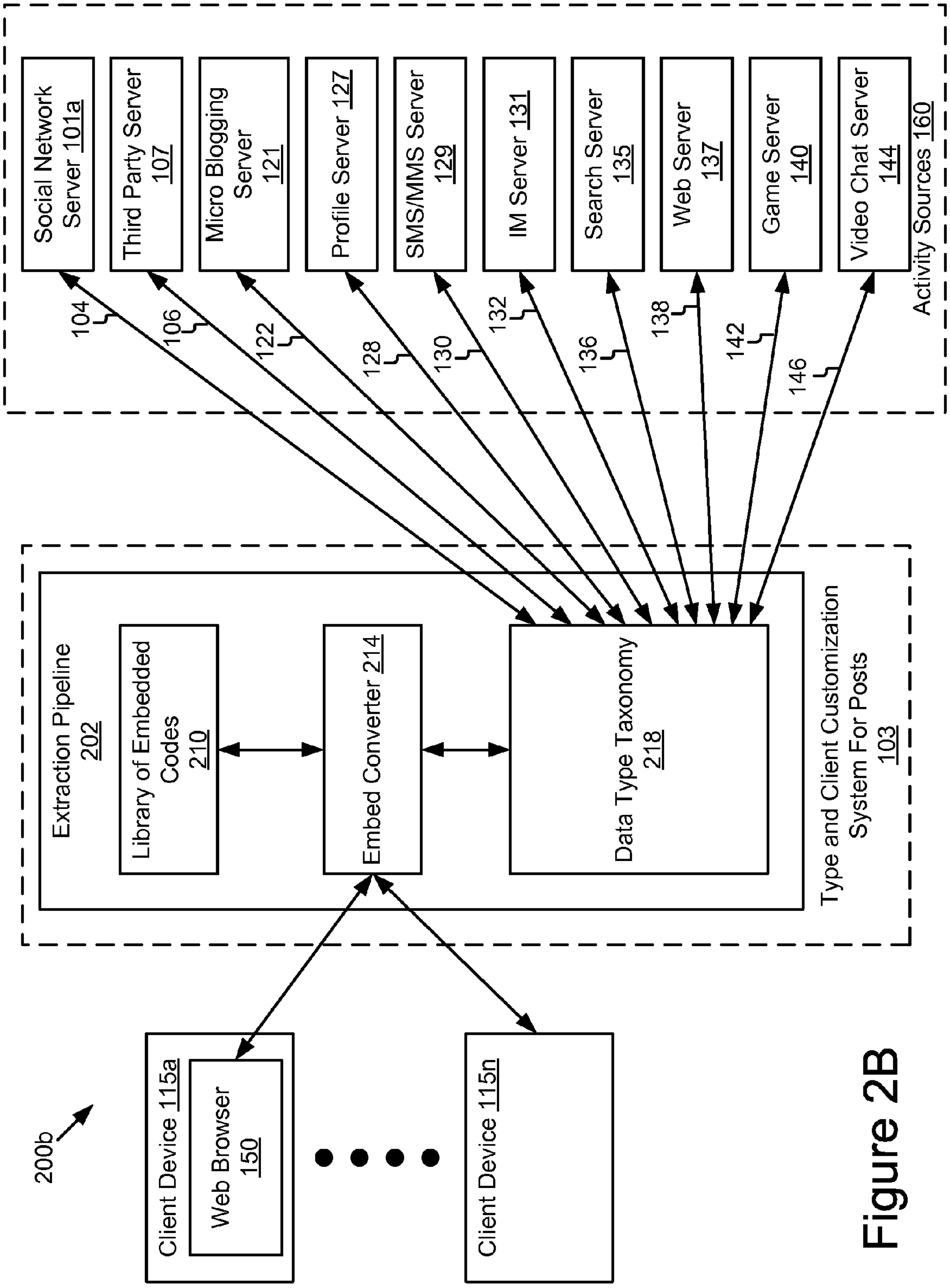

Social Network Server 101a
Third Party Server 107
Micro Blogging Server 121
Profile Server 127
SMS/MMS Server 129
IM Server 131
Search Server 135
Web Server 137
Game Server 140
Video Chat Server 144
Activity Sources 160
104
106
122
128
130
132
136
138
142
146
Extraction Pipeline 202
Rendering Pipeline 204
Type and Client Customization System For Posts 103
200a
Client Device 115a
Web Browser 150
Client Device 115n

Figure 2A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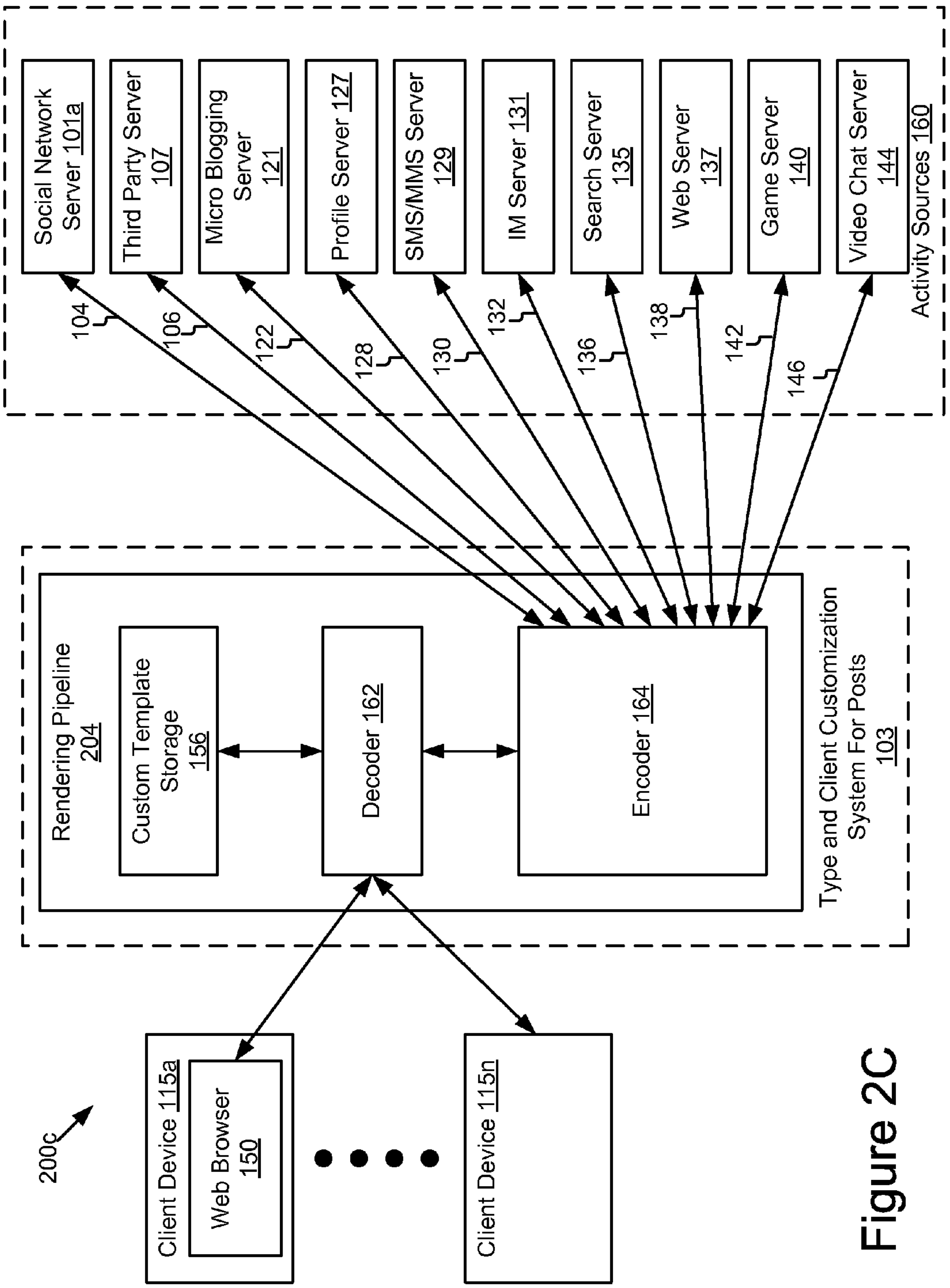
Profile Server 127
SMS/MMS Server 129
IM Server 131
Search Server 135
Web Server 137
Game Server 140
Video Chat Server 144
Activity Sources 160
104
106
122
128
130
132
136
138
142
146
Extraction Pipeline 202
Library of Embedded Codes 210
Embed Converter 214
Data Type Taxonomy 218
Type and Client Customization System For Posts 103
200b
Client Device 115a
Web Browser 150
Client Device 115n

Figure 2B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Third Party Server 107
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IM Server 131
Search Server 135
Web Server 137
Game Server 140
Video Chat Server 144
Activity Sources 160
104
106
122
128
130
132
136
138
142
146
Rendering Pipeline 204
Custom Template Storage 156
Decoder 162
Encoder 164
Type and Client Customization System For Posts 103
200c
Client Device 115a
Web Browser 150
Client Device 115n

Figure 2C

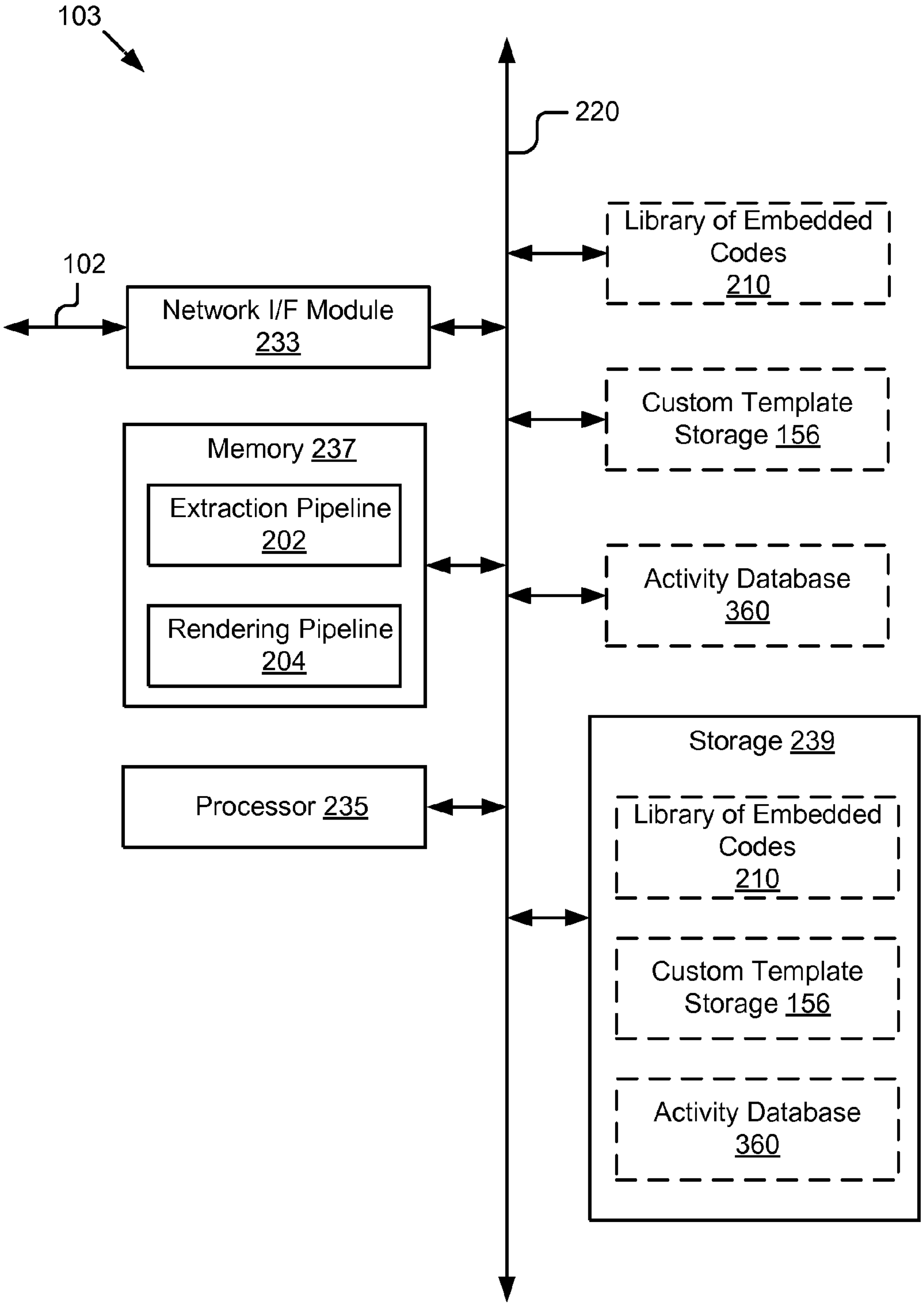
103
220
102
Network I/F Module 233
Library of Embedded Codes 210
Custom Template Storage 156
Memory 237
Extraction Pipeline 202
Rendering Pipeline 204
Activity Database 360
Processor 235
Storage 239
Library of Embedded Codes 210
Custom Template Storage 156
Activity Database 360

Figure 3A

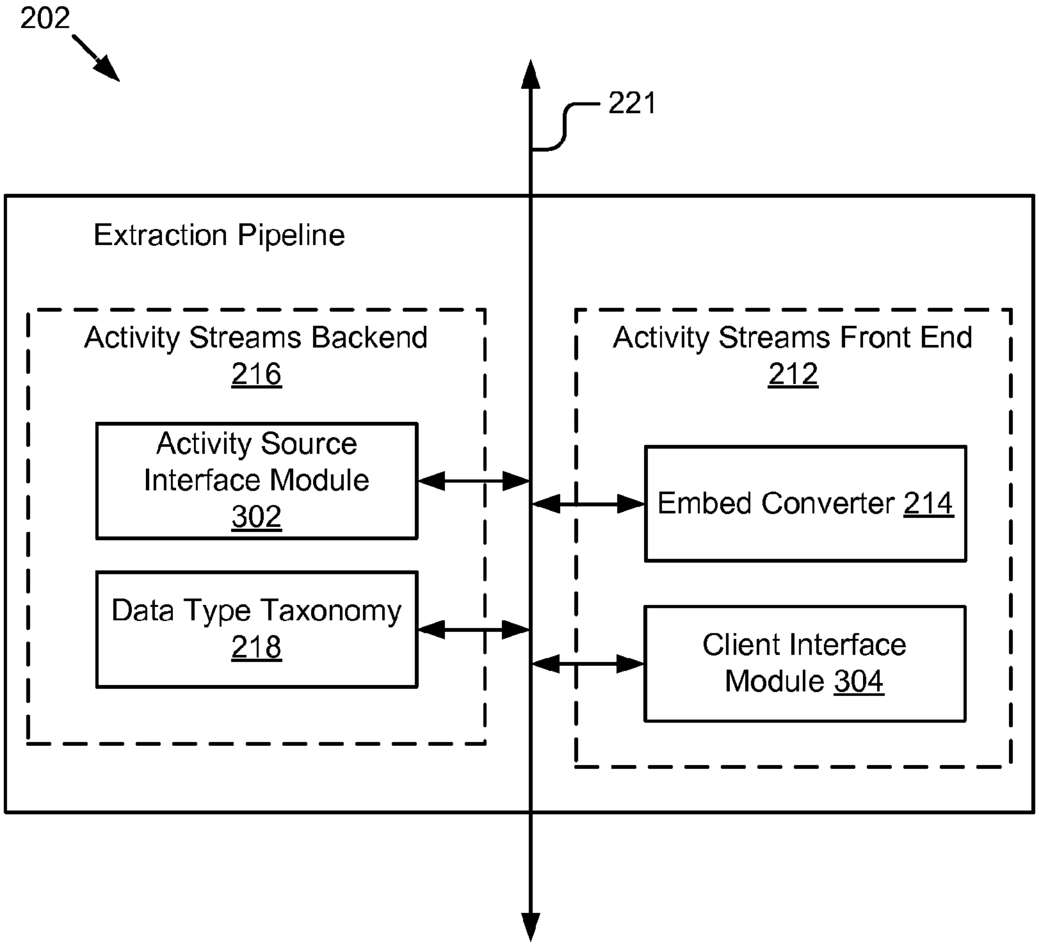
202
221
Extraction Pipeline
Activity Streams Backend 216
Activity Source Interface Module 302
Data Type Taxonomy 218
Activity Streams Front End 212
Embed Converter 214
Client Interface Module 304

Figure 3B

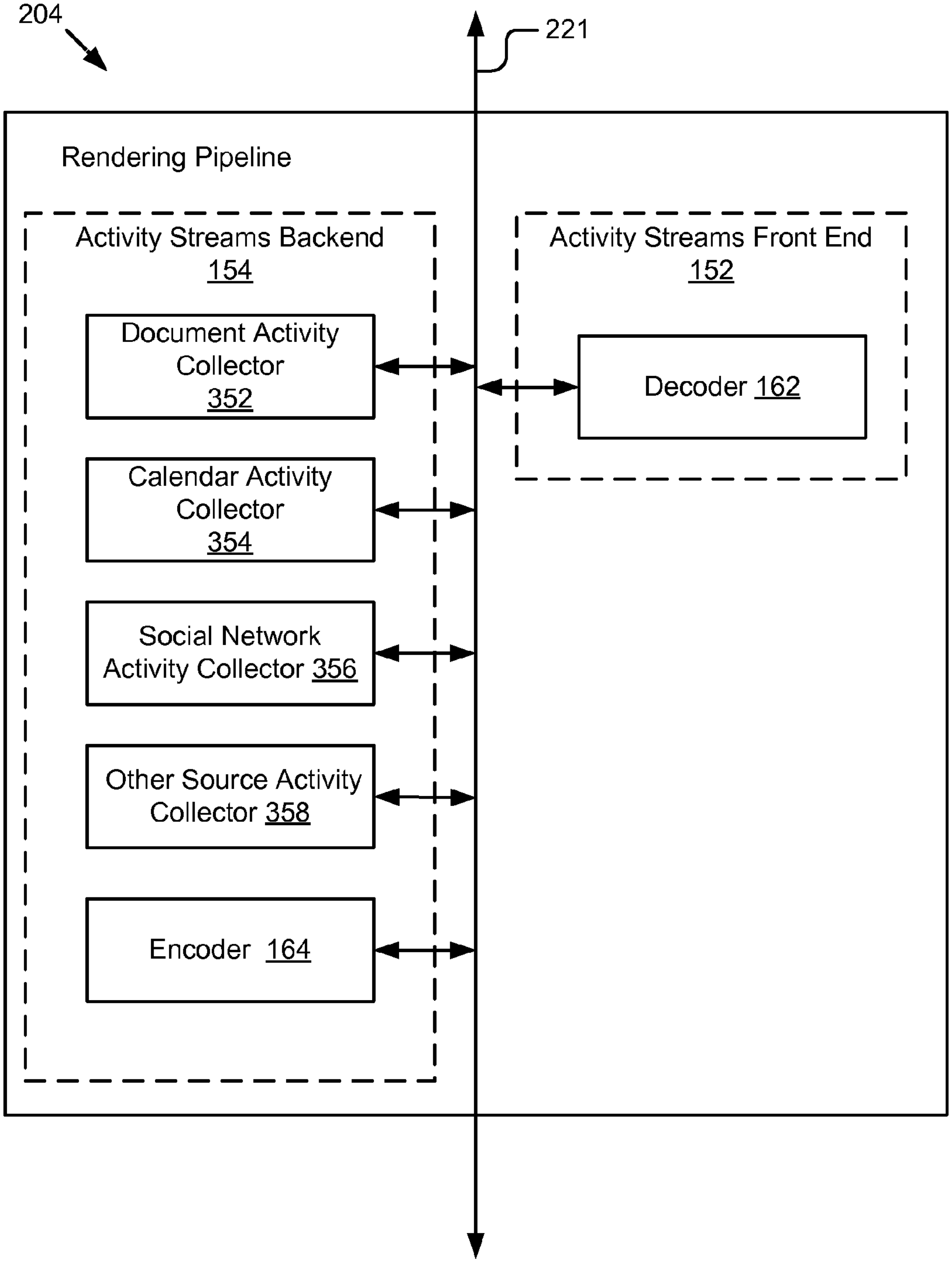
204
221
Rendering Pipeline
Activity Streams Backend
154
Document Activity Collector 352
Calendar Activity Collector 354
Social Network Activity Collector 356
Other Source Activity Collector 358
Encoder 164
Activity Streams Front End
152
Decoder 162

Figure 3C

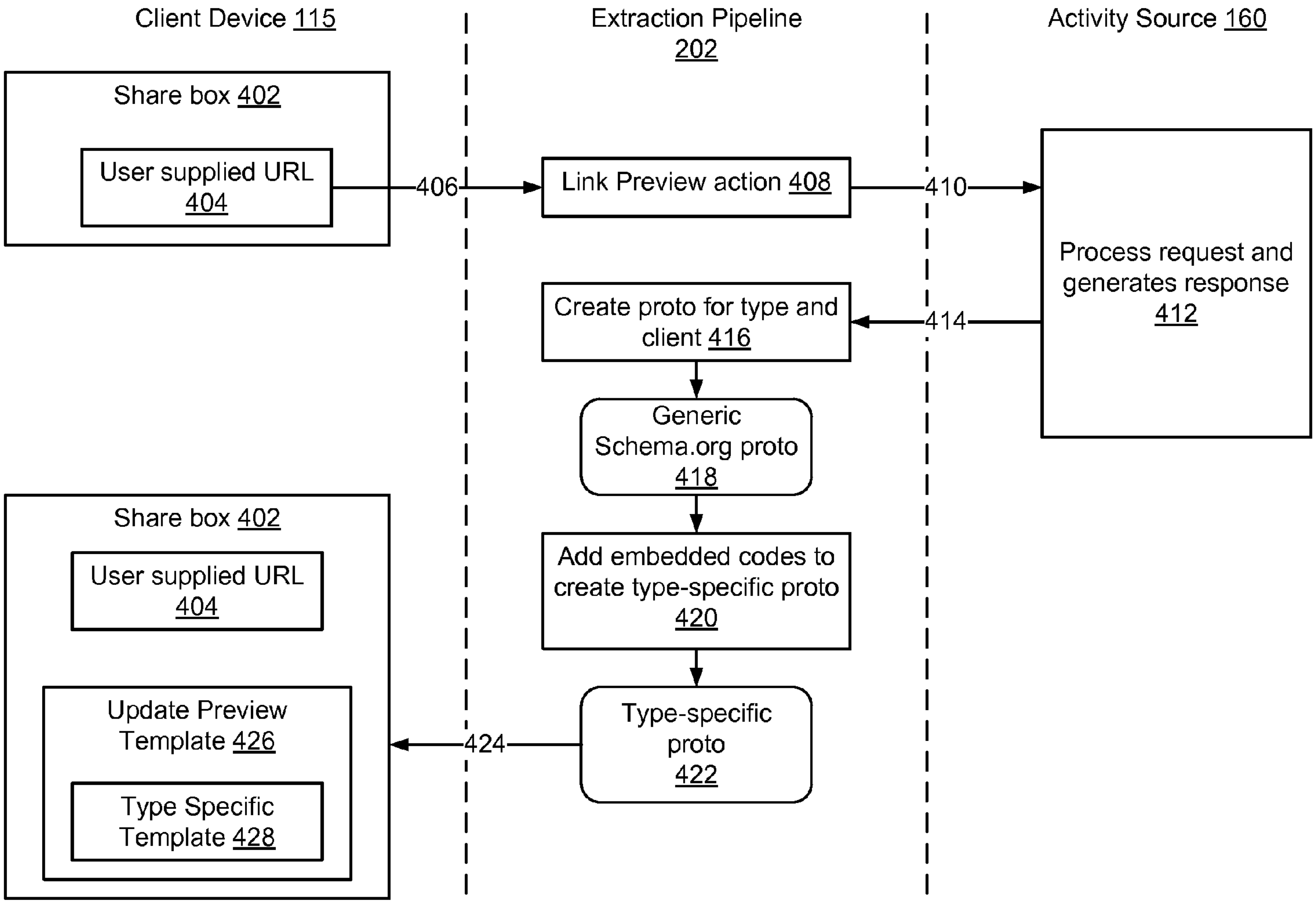
Client Device 115
Extraction Pipeline 202
Activity Source 160
Share box 402
User supplied URL 404
406
Link Preview action 408
410
Process request and generates response 412
414
Create proto for type and client 416
Generic Schema.org proto 418
Add embedded codes to create type-specific proto 420
Type-specific proto 422
424
Share box 402
User supplied URL 404
Update Preview Template 426
Type Specific Template 428

Figure 4

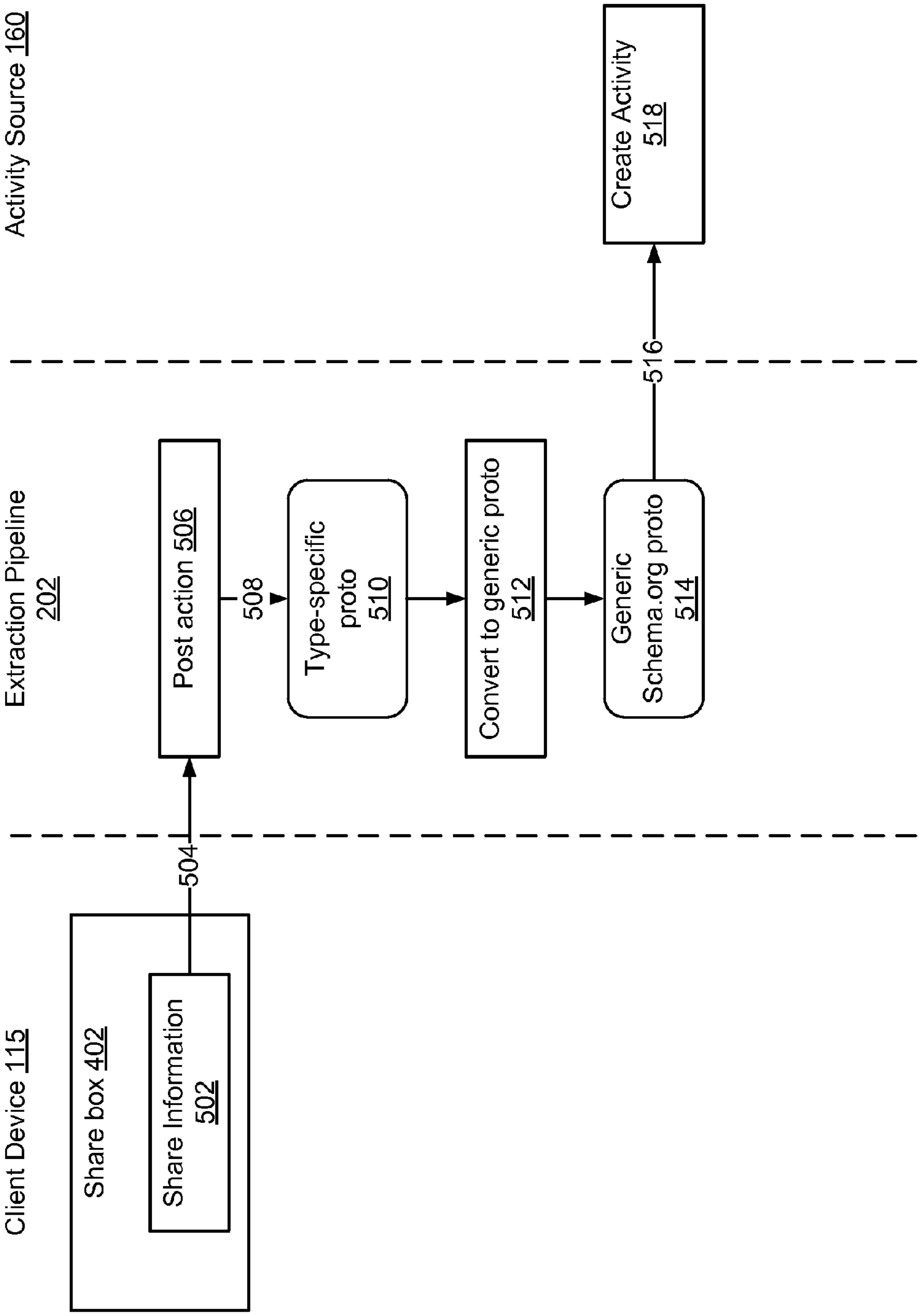
Client Device 115
Share box 402
Share Information 502
504
Extraction Pipeline 202
Post action 506
508
Type-specific proto 510
Convert to generic proto 512
Generic Schema.org proto 514
516
Activity Source 160
Create Activity 518

Figure 5

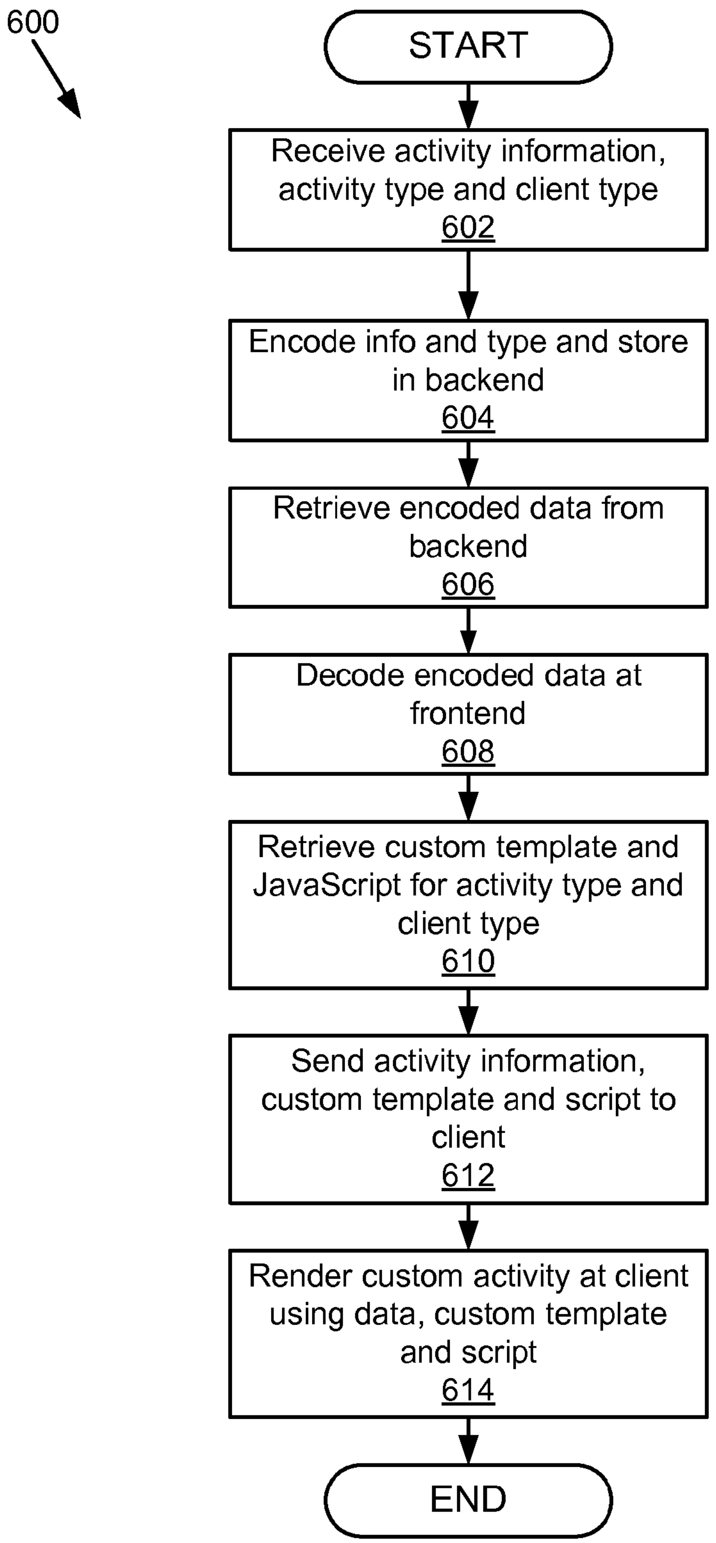
600
START
Receive activity information, activity type and client type
602
Encode info and type and store in backend
604
Retrieve encoded data from backend
606
Decode encoded data at frontend
608
Retrieve custom template and JavaScript for activity type and client type
610
Send activity information, custom template and script to client
612
Render custom activity at client using data, custom template and script
614
END

Figure 6

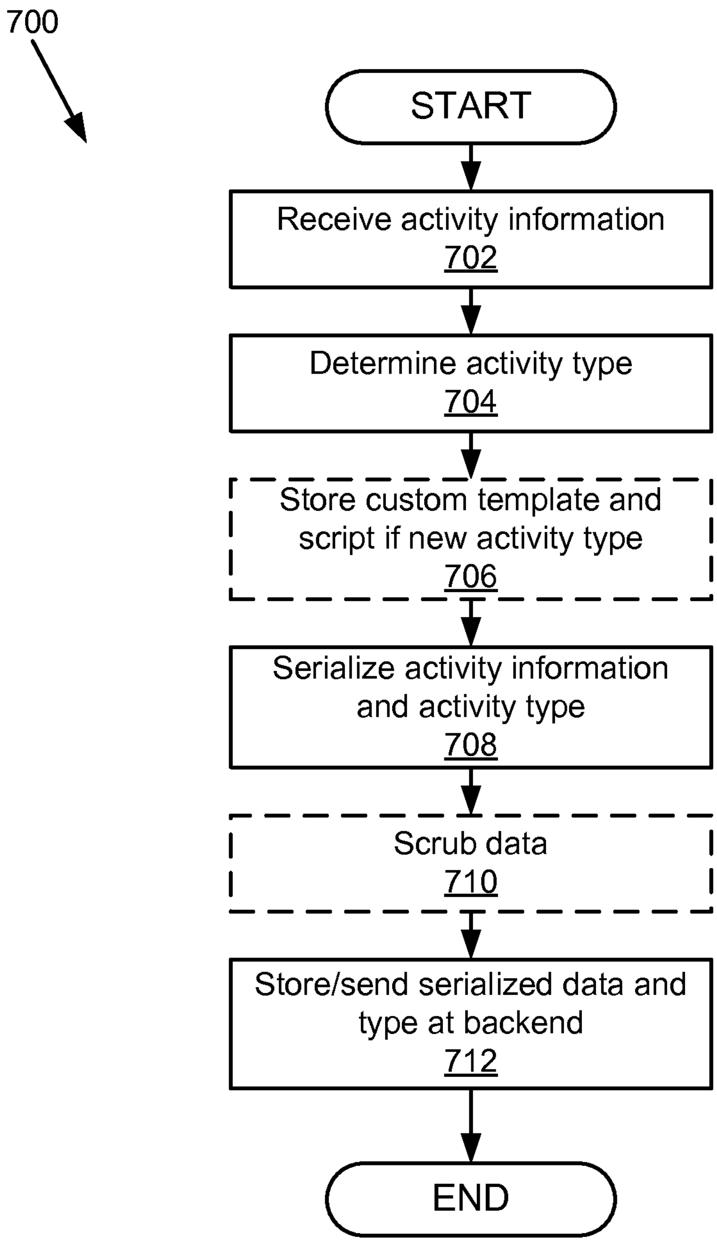
700
START
Receive activity information
702
Determine activity type
704
Store custom template and script if new activity type
706
Serialize activity information and activity type
708
Scrub data
710
Store/send serialized data and type at backend
712
END

Figure 7

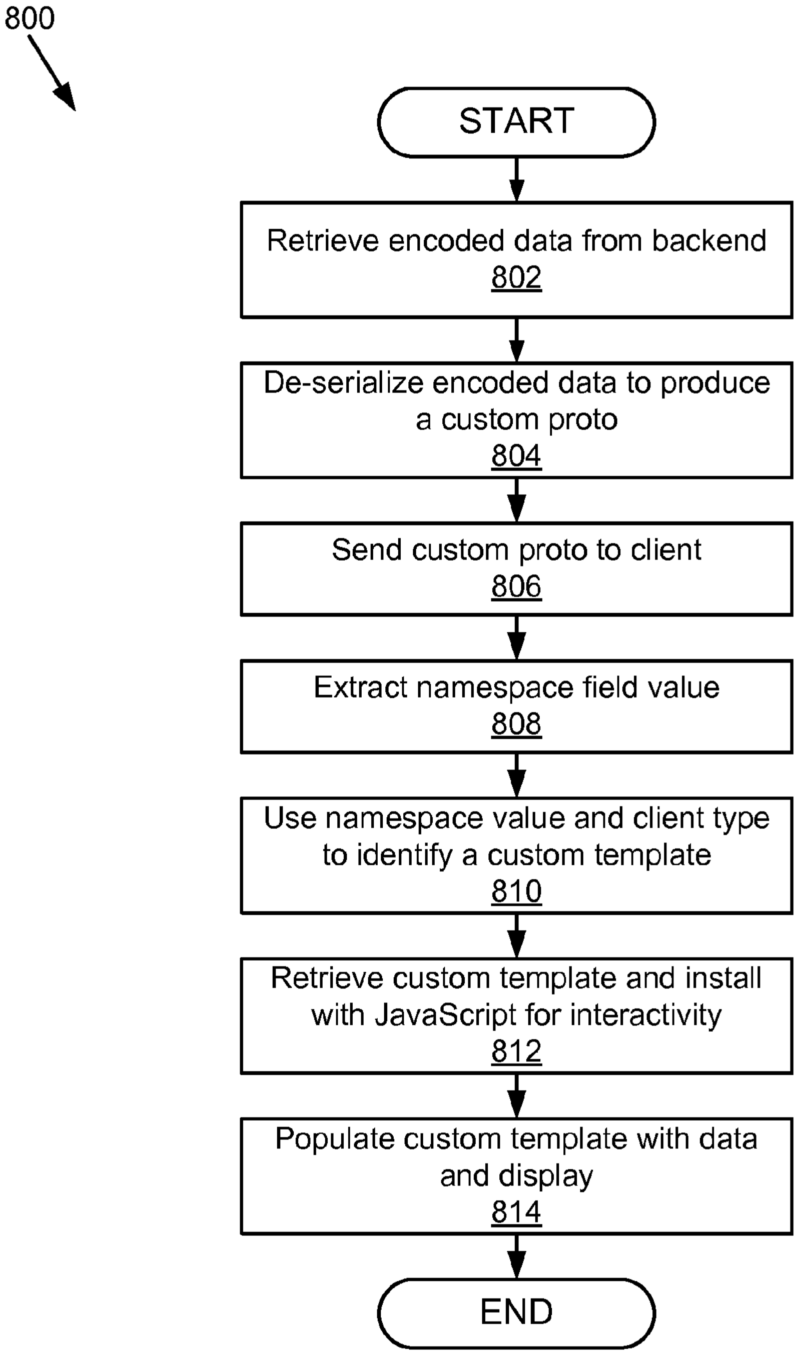
800
START
Retrieve encoded data from backend
802
De-serialize encoded data to produce a custom proto
804
Send custom proto to client
806
Extract namespace field value
808
Use namespace value and client type to identify a custom template
810
Retrieve custom template and install with JavaScript for interactivity
812
Populate custom template with data and display
814
END

Figure 8

CUSTOMIZING POSTS BY ACTIVITY TYPE AND CLIENT TYPE

CROSS REFERENCE TO RELATED APPLICATIONS

This application claims priority under 35 USC §119(e) to U.S. Application No. 61/614,717, entitled "Customizing Posts by Activity Type and Client Type" filed Mar. 23, 2012, the entirety of which is herein incorporated by reference.

BACKGROUND

The present disclosure relates to electronic communication and the delivery of activity streams. In particular, the present disclosure relates to per-client, per-type customizations to posts in an activity stream.

Users once operated their computing devices with a single browser showing a single webpage, new methods for delivering information such as activity on social networks have been developed. For example, new user interfaces in social networking and messaging tools provide new user interfaces for delivering an activity stream of information. From this activity stream user interface, users can share links, photos, videos, status messages and comments organized in streams or conversations and visible in the user's inbox.

Current systems and methods for providing these user activities have been limited to utilizing a predefined and fixed format for sending activity information from the activity sources and presenting the activity information at the client device. Attempts to customize presentation of the activity information and possible actions related to the activity information are difficult and must be done manually. This is not a trivial process and requires changes to the presentation template, the data format, and the JavaScript classes. Furthermore, there are new actions that can be taken in response to different activities (e.g., posts) that are addressed by current methods for processing activities.

SUMMARY

The present disclosure overcomes the deficiencies and limitations of the prior art at least in part by providing a system and associated methods for per-client, per-type customizations to posts in an activity stream. In some examples, a system for per-client, per-type customizations comprises an extraction pipeline and a rendering pipeline. The extraction pipeline can include a library of embedded codes, data type taxonomy and an embed converter. The data type taxonomy is coupled to an activity source to receive activity information, and to produce a first protocol buffer. The embed converter produces a type-specific protocol buffer from the first protocol buffer and the embedded code based in part upon the type of activity and the type of client. The type-specific protocol buffer is provided to the client device to process activity information or present activity information. The present disclosure also includes a method for processing a post in an activity stream including: receiving a client type corresponding to a client device; receiving activity information from an activity source; receiving an activity type; creating a first protocol buffer using the activity type and the activity information; adding embedded code to create a second protocol buffer, the embedded code selected based in part upon the client type and the activity type; and sending the second protocol buffer for rendering of the activity information.

BRIEF DESCRIPTION OF THE DRAWINGS

The disclosure is illustrated by way of example, and not by way of limitation in the figures of the accompanying drawings in which like reference numerals are used to refer to similar elements.

FIG. **1** is a high-level block diagram illustrating an architecture including a system for per-client, per-type customizations to posts in an activity stream according to some embodiments of the present disclosure.

FIGS. **2**A-**2**C are block diagrams of the architecture including a system for per-client, per-type customizations for posts according to some embodiments of the present disclosure.

FIG. **3**A is a block diagram illustrating a hardware architecture for per-client, per-type customizations to posts according to some embodiments of the present disclosure.

FIG. **3**B is a block diagram illustrating an extraction pipeline according to some embodiments of the present disclosure.

FIG. **3**C is a block diagram illustrating a rendering pipeline according to some embodiments of the present disclosure.

FIG. **4** is a sequence diagram of a preview action of an extraction pipeline according to some embodiments of the present disclosure.

FIG. **5** is a sequence diagram of a share operation of an extraction pipeline according to some embodiments of the present disclosure.

FIG. **6** is a flowchart of a method for storing and rendering custom posts in the activity stream according to some embodiments of the present disclosure.

FIG. **7** is a flowchart of a method for storing activity information and an activity type in an activity streams backend according to some embodiments of the present disclosure.

FIG. **8** is a flowchart of a method for rendering custom posts in the activity stream according to some embodiments of the present disclosure.

DETAILED DESCRIPTION

Example Overview

The description includes a system and associated methods for per-client, per-type customizations to posts in an activity stream. In some embodiments, the system includes an extraction pipeline and a rendering pipeline. In some examples, the extraction pipeline receives activity information from an activity source (e.g., a social network server, a search server, a web server, a third party server, etc.). The extraction pipeline processes the activity information to create a first protocol buffer. The term protocol buffer as used herein encompasses its plain and ordinary meaning including, but not limited to, a mechanism for encoding structured data in an extensible format. In one embodiment, the first protocol buffer is a generic schema.org protocol buffer. In another embodiment, the first protocol buffer is a serialization format with an interface description language. The extraction pipeline adds embedded code to the first protocol buffer and produces a type-specific protocol buffer from the first protocol buffer. For example, the extraction pipeline processes the generic schema.org protocol buffer and then converts it to a type-specific protocol buffer based in part upon an activity type and a client type. In general, embedded code refers to embedded code, files, data, objects or other information. In some embodiments, embedded code includes a type-specific protocol buffer, Java, JavaScript, one or more custom templates, and custom styling. The extraction pipeline provides the type-specific protocol to the client device for processing or presenting the activity information. For example, the client device processes the type-specific protocol buffer to generate a type-specific template for displaying the activity information.

In some embodiments, the extraction pipeline receives a client type corresponding to a client device, activity information and an activity type for the activity information from the client device. The extraction pipeline creates a type-specific protocol buffer based in part upon the client type and the activity type, and converts the type-specific protocol buffer to a generic protocol buffer. The extraction pipeline sends the generic protocol buffer to an activity source, causing the activity source to create an activity.

In some embodiments, the rendering pipeline retrieves activity information from one or more activity sources, and encodes the activity information and an activity type for the activity information. Examples of an activity type include, but not limited to, an activity type for posts from a particular source (e.g., a social network), an activity type for posts from a second source (e.g., a blog), an activity type for information that has a unique set of actions (e.g., the sharing of a photo) and an activity type for a particular online service, etc. The rendering pipeline encodes the activity information and the activity type into encoded information, and stores the encoded information in a storage device. For example, the rendering pipeline serializes the activity information into an encoded message protocol buffer (general data format). Upon receiving a request for an activity stream from a client device, the rendering pipeline retrieves the encoded information and decodes the encoded information. The rendering pipeline retrieves a custom template and a script based in part upon the activity type for the activity information and the client type for the client device. The rendering pipeline sends the decoded activity information, the custom template and the script to the client device, causing the client device to render a custom activity (e.g., a custom post) to a user using the decoded activity information, the custom template and the script.

System Overview

FIG. **1** is a high-level block diagram illustrating an architecture **100** including a system **103** for per-client, per-type customizations to posts (also referred to herein as the customization system **103** or type and client customization system for posts **103**) in an activity stream according to some embodiments of the present disclosure. The illustrated architecture **100** includes client devices **115***a*, **115***b*, **115***n* (also referred to herein individually and collectively as **115**) that are accessed by users **120***a*, **120***b*, **120***n* (also referred to herein individually and collectively as **120**), one or more social network servers **101***a*-**101***n* (also referred to herein individually and collectively as **101**) and the system **103** for per-client, per-type customizations. In the illustrated embodiment, these entities are communicatively coupled via a network **105**. Moreover, it should be recognized that while the present disclosure is described below primarily in the context of activities related to the social network server **101**, the present disclosure is applicable to any type of online communications.

The client devices **115***a*, **115***b*, **115***n* in FIG. **1** are used by way of example. While FIG. **1** illustrates three client devices **115***a*, **115***b*, **115***n*, the present disclosure applies to any system architecture having one or more client devices **115**. Although only three client devices **115** are illustrated, any numbers of client devices **115** are available to any number of users **120**. Furthermore, while only one network **105** is coupled to the client devices **115**, the social network server **101**, the system **103** and the third party server **107**, in practice any number of networks **105** can be connected to the entities. Furthermore, while only one third party server **107** is shown, the architecture **100** could include one or more third party servers **107**.

In some embodiments, the social network server **101***a* is coupled to the network **105** via signal line **104**. The social network server **101***a* also includes a social network software/application **109**. It will be recognized that though only three social network servers **101***a*-**101***n* are shown, any number of social network servers **101** may be present. A social network is any type of social structure where the users are connected by a common feature. The common feature includes relationships/connections, e.g., friendship, family, work, an interest, etc. The common features are provided by one or more social networking systems, such as those included in the architecture **100**, including explicitly defined relationships and relationships implied by social connections with other online users, where the relationships form a social graph **125**. In some examples, the social graph **125** can reflect a mapping of these users and how they are related. Furthermore, it should be understood that social network server **101***a* and social network software/application **109** are representative of one social network and that there are multiple social networks **101***b* . . . **101***n* coupled to the network **105**, each having its own server, application and social graph. For example, a first social network is more directed to business networking, a second is more directed to or centered on academics, a third is more directed to local business, a fourth is directed to dating and others of general interest or a specific focus.

While shown as stand-alone server in FIG. **1**, in other embodiments all or part of the system **103** for per-client, per-type customizations could be part of the third party server **107** that is connected to the network **105** via signal line **106**. The system **103** interacts with the other servers **101**, **107**, **121**, **127**, **129**, **131**, **135**, **137** via the network **105**. The system **103** is also coupled for communication with the client device **115***a*, which is connected to the network **105** via signal line **108**. The user **120***a* interacts with the client device **115***a*. Similarly, the client device **115***b* is coupled to the network **105** via signal line **112** and the user **120***b* interacts with the client device **115***b*. It should be recognized that the system **103** for per-client, per-type customizations can be stored in any combination of the devices and servers, or in only one of the devices or servers.

The network **105** is a conventional type, wired or wireless, and may have any number of configurations such as a star configuration, token ring configuration or other configurations. Furthermore, the network **105** may comprise a local area network (LAN), a wide area network (WAN) (e.g., the Internet), and/or any other interconnected data path across which multiple devices may communicate. In yet another embodiment, the network **105** may be a peer-to-peer network. The network **105** may also be coupled to or includes portions of a telecommunications network for sending data in a variety of different communication protocols. In yet another embodiment, the network **105** includes Bluetooth communication networks or a cellular communications network for sending and receiving data such as via short messaging service (SMS), multimedia messaging service (MMS), hypertext transfer protocol (HTTP), direct data connection, WAP, email, etc.

The system **103** for per-client, per-type customizations interacts with other systems **107**, **115**, **121**, **125**, **127**, **129**, **131** and **135** to retrieve/receive activity information or an activity stream and generate information or messages. The system **103** is coupled to the network **105** by signal line **102**. The system **103** cooperates with the client device **115** to generate and present user interfaces that allow the user **120** to view the activity stream. In some embodiments, the system **103** receives activity information from the other systems **107**, **121**, **125**, **127**, **129**, **131** and **135**. The customization system **103** processes this information to generate the activity stream. The customization system **103** interacts with the user **120** via client devices **115** to present the promotion information. For example, the customization system **103** interacts with the web browser **150** of the client devices **115** to receive inputs and generate user interfaces as will be described in more detail below. In another example, the customization system **103** generates activity messages and promotional messages and sends replies or commands to the related electronic communications from a Short Message Service (SMS)/Multimedia Messaging Service (MMS) server **129**, an instant messaging (IM) server **131**, a web server **137**, and/or the third party server **107**. In yet another example, the customization system **103** also receives data related to electronic communication from a search server **135** that includes a search engine **143** and is coupled to the network **105** via signal line **136**. In some embodiments, the search server **135** includes a search engine **143** for retrieving results that match search terms from the Internet. The web browser **150** and the customization system **103** are used to manage and send data to and from the third party server **107** via signal line **106**, the micro-blogging server **121** via signal line **122**, the profile server **127** via signal line **128**, the client devices **115** via signal lines **108** and **112**, the social graph **125** via signal line **126**, the SMS/MMS server **129** via signal line **130**, the IM server **131** via signal line **132** and the web server **137** via signal line **138**. Although depicted in FIG. **1** as separate from the social network server **101** and the social network application **109**, it should be understood that in some embodiments, the customization system **103** could be part of the social network server **101** or the social network application **109**.

The system **103** for per-client, per-type customizations is particularly advantageous because it provides per-client customization. Per-client customizations enable the possibility of many different types of client (e.g. desktop, native mobile, mobile app, tablet, etc.) on the same codebase. The customization system **103** is advantageous because it: 1) provides greater code reuse via common building-block components; 2) provides a single system/solution; 3) allows multiple teams/individuals to develop custom posts standalone and in parallel; 4) supports multi-client use cases; 5) provides built-in support for common leak protection; and 6) provides built-in support for easy late-loading to minimize downloads and reduce latency.

In some embodiments, the social network server **101**, the customization system **103**, the third party server **107**, the micro-blogging server **121**, the profile server **127**, the SMS/MMS server **129**, the IM server **131**, the search server **135** and the web server **137** can be any computing devices such as hardware servers including a processor, memory, and network communication capabilities. The client device **115***a*, **115***b* . . . **115***n* can be a computing device, for example, a laptop computer, a desktop computer, a tablet computer, a mobile telephone, a personal digital assistant (PDA), a mobile email device, a portable game player, a portable music player, a television with one or more processors embedded therein or coupled thereto or any other electronic device capable of accessing a network.

Customization System **103**

FIGS. **2**A-**2**C are block diagrams of the architecture **200***a*, **200***b* and **200***c* including a system **103** for per-client, per-type customizations for posts according to some embodiments of the present disclosure. FIGS. **2**A-**2**C show the customization system **103** in more detail. In FIGS. **2**A-**2**C, like reference numerals have been used to reference like components with the same or similar functionality that has been described above with reference to FIG. **1**. Further, since those components have been described above that description will not be repeated here. In some embodiments, the plurality of client devices **115***a*-**115***n* includes the web browser **150** and is coupled for communication with the customization system **103**. The customization system **103** and the web browsers **150** cooperate to generate and present for the user the posts of the present disclosure. The customization system **103** comprises an extraction pipeline **202** and a rendering pipeline **204**. The activity sources **160** include one or more from the group of the social network server **101**, the third party server **107**, the micro-blogging server **121**, the profile server **127**, the SMS/MMS server **129**, the IM server **131**, the search server **135** and the web server **137**, all of which have been described above. The activity sources **160** may also include: a game server **140** for sending information related to an online game and receiving commands related to that game, and a video chat server **144** for sending information related to a video chat and receiving commands related to that video chat. The game server **140** is coupled to the customization system **103** by signal line **142**. The video chat server **144** is coupled to the customization system **103** by signal line **146**.

As shown, the second embodiment for the architecture **200***a*, **200***b* and **200***c* includes a plurality of client devices **115***a*-**115***n*, the customization system **103** for extracting and rendering custom posts and a plurality of activity sources **160**. The system **103** for per-client, per-type customizations is particularly advantageous because each post is a mini application. More specifically, each post type has a corresponding stream app (application). The stream application is a bundle of Java, protocol buffers, JavaScript, server and client-side support, one or more rendering templates (or a set of rendering templates) and custom style sheets that define a mini application for the activity stream. Each stream app uses common post elements, for example, comment and sharing actions, author icons, classical texts, abuse reporting, etc. In some embodiments, the stream app supports share box preview, resharing preview, resharing annotations, collapse/expand user text, edit user text, edit of embedded code, abuse reporting/mute/block, options menu items, explanations, comments, endorsements, and real-time updates. The present disclosure is particularly advantageous because each stream app can also implement its own custom behaviors and appearances. In some embodiments, the stream apps are independently loaded on demand.

Referring now to FIG. **2**A, the system **103** for per-client, per-type customization according to some embodiments is shown in more detail. The customization system **103** includes an extraction pipeline **202** and a rendering pipeline **204**. The extraction pipeline **202** receives information from the client device **115**, processes the information and provides it to an activity source **160** and then processes information from the activity source **160** so that it can be provided to the client device **115**. Some embodiments of the extraction pipeline **202** are described in more detail below with reference to FIGS. **2**B and **3**B. The operation of the extraction pipeline **202** is also described below with reference to FIGS. **4**-**5**. The rendering pipeline **204** receives information and processes it for display on the web browser **150** of the client device **115**. Some embodiments of the rendering pipeline **204** are described in greater detail below with reference FIGS. **2**C and **3**C. The operation of the rendering pipeline **204** is also described below with reference to FIGS. **6**-**8**. The customization system **103** is advantageous because it supports faster standalone development of independent components, provides common building block components, isolates core stream development from the development of independent components, and provides easy late loading. In other words, the customization system **103** provides a coherent framework that is extensible, provides common building block components, allows multiple teams to build custom posts standalone and in parallel and provides support for the multi-client use case.

Referring now to FIG. **2**B, the extraction pipeline **202** of the system **103** for per-client, per-type customization according to some embodiments is shown in more detail. In some embodiments, the extraction pipeline **202** includes: a library **210** of embedded code, an embed converter **214**, and a data type taxonomy **218**.

The library **210** of embedded code can be a group of embedded codes. The embedded code provides a way to represent, transmit, store and render rich structured attachments. In some embodiments, the embedded code is defined by both client type and activity type. Each of the embedded codes includes common building block components of common types, for example, type-specific protocol buffers, a set of rendering templates or custom templates, Java, JavaScript, custom styling, e.g. via custom style sheet systems, etc. One example of a type-specific protocol buffer is shown below.

```
message PhotoUpdate {
   option (item_type)=IMAGE_OBJECT;
   extend EmbedClientItem [optional PhotoUpdate
      photo=N;
}
   optional string url=1
      [(in_item scope)=true];
   optional string description=2
      [(in_item scope)=true];
   optional Place content_location=3
      [(in_item scope)=true];
   optional string thumbnail_url=4
      [(in_item scope)=true];
   optional string proxied_thumbnail_url=5
      [(in_item scope)=false,
   (presenter)=THUMBNAIL_IMAGE_PROXY];
}
```

The embedded codes are used by the stream applications for their canonical representation of the attached content. In some embodiments, the stream out may optionally process, transform color render or suppress embedded data for display purposes. Further, in some embodiments, the embedded data is used to represent non-plain text data attached to a post when that data represents something that can be displayed or manipulated in the stream, or something that makes sense to first or third party users. Example embedded code types include: plain text, video, photo, photo album, web link, location, video conference, event, music album or song, video playlist, etc.

The embed converter **214** can be software or routines for processing the stream apps and providing information to the client device **115**. More specifically, the embed converter **214** uses the library of embedded code **210** and the data type taxonomy **218** to produce content in a format displayable on the web browser **150**. The embed converter **214** receives data from the activity sources **160** for presentation on the client device **115** according to the data type taxonomy **218**. In other words, the activity sources **160** provide data in the data type taxonomy **218**. The embed converter **214** extracts the data from the data type taxonomy **218** and then utilizes the library **210** of embedded code to present the data on the web browser **150**. More specifically, the embed converter **214** formats and sends the data according to the type specific protocol buffers of the associated embedded code. For a given activity type and a given client type, the embed converter **214** may also format the data so that it is presented in an attractive and appropriate manner on the client device **115**. For example, the embed converter **214** may format the data in a first manner so that it is suitable where the client device **115** is a mobile phone or the embed converter **214** can format the data in a second manner so that it is suitable for a desktop. In summary, the embed converter **214** is a lossless converter that retrieves data from the data type taxonomy **218** and uses the library **210** of embedded code that specifies presentation to output information to the client devices **115**. The operation of the embed converter **214** will be better understood with reference to description below and FIGS. **4** and **5**.

The data type taxonomy **218** is a classification and hierarchical organization of data types. In some embodiments, the data type taxonomy **218** is a hierarchy such as schema.org. The activity sources **160** provide data to the extraction pipeline **202** in data structures that comply with the shared definitions in the data type taxonomy **218**. In some embodiments, the data type taxonomy **218** includes a protocol buffer that includes a flat name space of the known data fields. In some embodiments, a protocol buffer is a serialization format with an interface description language. Each protocol buffer has a type field that includes a subset of data type taxonomy **218** fields valid for that protocol buffer. The type field is a repeated field, indicating the inheritance hierarchy of that type (e.g., thing>creative work>article>blog post).

Referring now to FIG. **2**C, the rendering pipeline **204** of the system **103** for per-client, per-type customization according to some embodiments of the customization system **103** is shown in more detail. The rendering pipeline **204** includes custom template storage **156**, a decoder **162** and an encoder **164**. The operation of the rendering pipeline **204** and its components will be described in more detail below with reference to FIGS. **3**C and **6**-**8**. The encoder **164** is coupled to the decoder **162** to send activity data for the web browsers **150**. The encoder **164** is also coupled to the activity sources **160** to receive activity information which it sends to the decoder **162** which in turn translates the activity information into the activity stream. The decoder **162** is also coupled to the custom template storage **156** to receive information about how the activity information is to be presented on the web browser **150**.

Example System

FIG. **3**A is a block diagram illustrating a hardware architecture for a customization system **103** according to some embodiments of the present disclosure. In some embodiments, the system **103** comprises: a network interface module **233**, a processor **235**, a memory **237**, a storage **239**, the library **210** of embedded code, the custom template storage **156** and an activity database **360**. The library **210** of embedded code, the activity database **360** and the custom template storage **156** are depicted using dashed lines to indicate that, in some embodiments, the library **210** of embedded code, the activity database **360** and the custom template storage **156** are part of the storage **239**. These components of the system **103** are communicatively coupled by a bus **220**.

The network interface module **233** is coupled to the network **105** by signal line **102** and to the bus **220**. The network interface module **233** includes ports for wired connectivity such as but not limited to USB, SD, or CAT-5, etc. The network interface module **233** links the processor **235** to the network **105** that may in turn be coupled to other processing systems. The network interface module **233** provides other conventional connections to the network **105** using standard network protocols such as TCP/IP, HTTP, HTTPS and SMTP.

In other embodiments, the network interface module **233** includes a transceiver for sending and receiving signals using Wi-Fi, Bluetooth® or cellular communications for wireless communication.

The processor **235** comprises an arithmetic logic unit, a microprocessor, a general purpose controller or some other processor array to perform computations and provide electronic display signals to a display device. The processor **235** is coupled to the bus **220** for communication with the other components. Processor **235** processes data signals and may comprise various computing architectures including a complex instruction set computer (CISC) architecture, a reduced instruction set computer (RISC) architecture, or an architecture implementing a combination of instruction sets. Although only a single processor is shown in FIG. **3**A, multiple processors may be included. Other processors, operating systems, sensors, displays and physical configurations are possible.

The memory **237** stores instructions and/or data that may be executed by the processor **235**. The memory **237** is coupled to the bus **220** for communication with the other components. The instructions and/or data may comprise code for performing any and/or all of the techniques described herein. The memory **237** may be a dynamic random access memory (DRAM) device, a static random access memory (SRAM) device, flash memory or some other memory device known in the art.

In the illustrated embodiment, the memory **237** includes the extraction pipeline **202** and the rendering pipeline **204**. The extraction pipeline **202** and the rendering pipeline **204** are described in more detail below with reference to FIGS. **3**B and **3**C, respectively.

In some embodiments, the storage **239** stores data, information and instructions used by the customization system **103**. Such stored information includes information about users, information about messages, stream applications, and other information retrieved from the activity sources **160**. In some embodiments, the storage **239** also stores data and other information utilized by the customization system **103** from the client devices **115**. In another embodiment, the library **210** of embedded code or the custom template storage **156** is part of the storage **239**. The storage **239** is a non-volatile memory or similar permanent storage device and media such as a hard disk drive, a floppy disk drive, a CD-ROM device, a DVD-ROM device, a DVD-RAM device, a DVD-RW device, a flash memory device, or some other mass storage device known in the art for storing information on a more permanent basis. The storage **239** is coupled to the bus **220** for communication with other components of the customization system **103**.

In some embodiments (See also FIG. **3**C), the storage **239** stores information retrieved by the activity streams backend **154**, in particular, collector modules **352**, **354**, **356** and **358** and the activity database **360**. In some embodiments, the storage **239** also stores data and other information utilized by the activity streams front end **152**. The storage **239** is coupled by the bus **220** for communication with other components **152**, **154**, **156**, **233**, **235** and **237** of the rendering pipeline **204**.

The library **210** of embedded code has been described above with reference to FIG. **2**B. The library **210** of embedded code has a similar operation function here. The library **210** of embedded code is coupled to the bus **220** for cooperation with other components of the system **103**. The custom template storage **156** and the activity database **360** are also coupled to the bus **220** for communication with other components of the system **103**. The custom template storage **156** and the activity database **360** are described in more detail below with reference to FIG. **3**C.

Extraction Pipeline **202**

FIG. **3**B is a block diagram illustrating an extraction pipeline **202** according to some embodiments of the present disclosure. In some embodiments, the extraction pipeline **202** includes an activity streams backend **216** and an activity streams front end **212** that communicate over the software communication mechanism **221**. Software communication mechanism **221** may be an object bus (such as CORBA), direct socket communication (such as TCP/IP sockets) among software modules, remote procedure calls, UDP broadcasts and receipts, HTTP connections, function or procedure calls, etc. Further, any or all of the communication could be secure (SSH, HTTPS, etc). The software communication can be implemented on any underlying hardware, such as a network, the Internet, a bus **220**, a combination thereof, etc.

The activity streams backend **216** includes an activity source interface module **302** and the data type taxonomy **218**. The activity source interface module **302** may be software or routines executable by the processor **235** to receive or retrieve activity information from the activity sources **160**. The activity source interface module **302** cooperates with the data type taxonomy **218** to process data and other information, and sends it to the activity streams front end **212**. In some embodiments, the activity source interface module **302** receives information from the activity sources **160** and stores it in a data format consistent with the data type taxonomy **218**. In some embodiments, the activity streams backend **216** also includes a second embed converter (not shown) to receive and process information from the activity sources **160** and then store the processed data according to the data type taxonomy **218**. The data type taxonomy **218** has been described above with reference to FIG. **2**B and has the similar function or operation here. The activity source interface module **302** and the data type taxonomy **218** are coupled for communication with the other components of the extraction pipeline **202** by the software communication mechanism **221**.

The activity streams front end **212** comprises the embed converter **214** and a client interface module **304**. The embed converter **214** has been described above and has the same or similar functionality here. The embed converter **214** is coupled to the software communication mechanism **221** for communication with the other components of the extraction pipeline **202**. In one embodiment, the client interface module **304** is communicatively coupled to the library **210** of embedded code. The client interface module **304** may be software or routines executable by the processor **235** to communicate with the client device **115**. For example, the client interface module **304** receives links and indication of the client type from the client device **115**. The client interface module **304** also cooperates with the embed converter **214** to send information and formatting data such as XML to the client browser **150** for presentation to the user. The client interface module **304** is also coupled to the software communication mechanism **221** for communication and cooperation with the other components of the extraction pipeline **202**.

Rendering Pipeline **204**

FIG. **3**C is a block diagram illustrating the rendering pipeline **204** according to some embodiments of the present disclosure. In some embodiments, the rendering pipeline **204** comprises: an activity streams backend **154** and an activity streams front end **152** that communicate over the software communication mechanism **221**.

In some embodiments, the activity streams backend **154** comprises a document activity collector **352**, a calendar activity collector **354**, a social network activity collector **356**, an other source activity collector **358**, an activity database **360**, and the encoder **164**. These components **352**, **354**, **356**, **358**, **360** and **164** are coupled to the software communication mechanism **221** for communication with each other and other components of the rendering pipeline **204**.

The document activity collector **352** may be software or routines for interacting with a document system coupled to the activity streams backend **154** via the network **105**. In some embodiments, the document activity collector **352** interacts with a document management system to retrieve information such as user interactions with documents, which documents were reviewed or edited, and how much time was spent interacting with a document, etc. The document activity collector **352** in some embodiments interacts with a credential module (not shown) to retrieve the user's login name and password as well as any other information necessary to access the document system. The document activity collector **352** also stores information that has been retrieved in the activity database **360**. The document activity collector **352** is coupled for communication with other document servers and the storage **239**. It should be recognized that even though the document activity collector **352** has been described above as connecting and extracting information from a single document system, the document activity collector **352** may perform the same operation for a plurality of document systems that is utilized by a particular user.

The calendar activity collector **354** may be software or routines for interacting with the profile server **127** coupled to the activity streams backend **154** via the network **105**. In some embodiments, the calendar activity collector **354** interacts with the profile server **127** to retrieve profile information such as calendar events. In some embodiments, the profile server **127** is a free time management web application. The calendar activity collector **354** also stores received calendar activity information in the activity database **360**. The calendar activity collector **354** also sends commands and instructions to the profile server **127** to change calendar events, add calendar events, modify parties associated with events, delete events, etc.

The social network activity collector **356** may be software or routines for interacting with the one or more social network servers **101** or systems. In some embodiments, the social network activity collector **356** is coupled to the network **105** for communication and interaction with the social network server **101**, the social network application **109** and the social graph **125**. The social network activity collector **356** is similar to the calendar activity collector module **354** except that it collects activity information related to a user's interaction and use of a social network. The social network activity collector **356** interacts with a credential module to retrieve the user's login and password as well as other information necessary to access the social network application **109** and the social graph **125**. The social network activity collector **356** retrieves and collects activity information about messages sent, messages received, information posted, posted information reviewed, change in status of friends, addition of connections, removal of connections, friend requests, and any other activity that can be undertaken by the user on the social network. The social network activity collector **356** also collects information from other individuals that are important or linked to the user. In some embodiments, the application interface (API) of the social network is used by the social network activity collector **356** to extract information. Thus, it will recognize that the social network activity collector **356** can retrieve any information related to the user from the social network. The social network activity collector **356** stores the information it collects in the activity database **360**. The social network activity collector **356** is coupled by the software communication mechanism **221**. Example activities include friend requests, a post to a source being monitored, or any other activity on the social network of importance to the user. The social network activity collector **356** also interacts with the social network to respond to any activity such as accepting the friend request, replying to a post or any other action on the social network that is possible in response to the activity.

The other source activity collector **358** may be software or routines for interacting with and extracting information from any other electronic communication system or any other activity sources **160**. The other source activity collector **358** has the credentials and the application interface for interacting with the other activity sources **160**. The other source activity collector **358** monitors the other activity sources **160** for activities of which the user wants to be notified and also can take any action with regard to the activities that is allowed by the other activity sources **160**. The other source activity collector **358** collects information related to the user's interaction with those other systems. The other source activity collector **358** stores the information collected in the activity database **360**. Example other sources **160** include the third party server **107**, the micro-blogging server **121**, the SMS/MMS server **129**, the IM server **131**, the search server **135** and the web server **137**.

The activity database **360** is data storage for storing information received from any of the activity sources **160**. In some embodiments, the activity database **360** is a database organized by user. For each user, the activity database **360** stores any activity information received from any of the activity sources **160**. For example, this can include documents, document status, document interaction statistics, and social network activities such as posts, shares, invitations, status changes etc. The activity database **360** is coupled for communication with the activity collectors **352**, **354**, **356** and **358**. The activity database **360** is also coupled to the activity streams front end **152** to provide activity information responsive to queries from the client devices **115** and to provide the raw data used to generate the activity stream.

The encoder **164** may be software or routines for encoding activity information and an activity type. In some embodiments, the encoder **164** cooperates with the other components of the activity streams backend **154** to receive activity information and an associated activity type. In some embodiments, there are multiple activity types such as an activity type for posts from a particular source (e.g., a social network), and an activity type for posts from a second source (e.g., a blog), an activity type for information that has a unique set of actions (e.g., the sharing of a photo), an activity type for a particular online service, etc. Thus the activity types may be defined by the source of the information; the type of information and the manner in which it should be presented; and the action or the group of actions that may be taken in response to the information. The encoder **164** is coupled to the other components of the activity streams backend **154** to receive activity information. The encoder **164** is also coupled to receive the activity type for the information either from the activity sources **160** or the activity database **360** or by analysis of the activity information. The encoder **164** encodes the activity information and the activity type into encoded information. For example, the encoder **164** serializes the activity information into an encoded message protocol buffer (general data format). In some embodiments, the encoder **164** stores the encoded information into the activity database **360** for access by the activity stream front end **152**. In another embodiment, the encoder **164** also scrubs the information or anonymizes it before encoding.

The activity streams front end **152** is software or routines for processing requests that are received from the client devices **115**. The activity streams front end **152** is coupled for communication with the client devices **115**, in particular, the web browser **150**. The activity streams front end **152** receives and processes requests from the client devices **115** for an activity stream. The activity streams front end **152** serves as a controller to process requests for activity streams, to send activity streams, to send formatting information for the activity streams, to send control signals to and from the client devices **115**, and to send user interaction information to the activity streams backend **154**. The activity streams front end **152** is coupled to receive activity stream data from the activity streams backend **154** and generate an activity stream for the user. In some embodiments, the activity streams front end **152** includes a decoder **162**. The activity streams front end **152** retrieves activity stream information in an encoded or serialized format from the activity streams backend **154**. The decoder **162** decodes or de-serializes the encoded information from the activity streams backend **154** into data for the custom post and an activity type. The activity streams front end **152** is also coupled to the custom template storage **156** to retrieve and use templates and scripts or send templates and scripts to the client devices **115** as requested. The activity streams front end **152** also passes on commands to the activity streams backend **154** for transmission to and execution by the activity sources **160**.

The custom template storage **156** is data storage for storing information about different templates that can be used to present activity information to the user. In some embodiments, the customization system **103** has defined a number of different activity types. Each of the activity types includes a customized template for displaying information related to that activity type. In some embodiments, the customized template specifies the formatting and types of information displayed. The custom template also specifies what other actions or buttons are presented along with the activity information. For example, the actions appropriate for a comment post versus a photo being shared will be different. The custom template identifies the actions that can be taken with regard to the activity information and thereby allows customization of the rendering that is specific to the activity information. The activity type is also associated with JavaScript or a JavaScript class for use in rendering the data in the customized template. This is particularly advantageous because rather than being limited to a single method for rendering posts or being forced to create a custom rendering for each individual post, the custom template storage **156** allows the templates to be reused according to activity types which are likely to have similar characteristics. In some embodiments, the post includes additional type-specific data that can be used to decide which specific custom template to use. The custom template storage **156** is coupled for communication with the activity stream front end **152**. In another embodiment, the custom template storage **156** can be accessed directly by the client device **115**. In some embodiments, the custom template storage **156** is not required and the templates are compiled directly into binary files.

One or more of the document activity collector **352**, the calendar activity collector **354**, the social network activity collector **356**, the other source activity collector **358**, the encoder **164**, the activity streams backend **154**, the activity streams front end **152** and the decoder **162** are executable by the processor **235**. In another embodiment, one or more of the document activity collector **352**, the calendar activity collector **354**, the social network activity collector **356**, the other source activity collector **358**, the encoder **164**, the activity streams backend **154**, the activity streams front end **152** and the decoder **162** store data that, when executed by the processor **235**, causes the collectors/modules to perform the operations described below. In yet another embodiment, one or more of the document activity collector **352**, the calendar activity collector **354**, the social network activity collector **356**, the other source activity collector **358**, the encoder **164**, the activity streams backend **154**, the activity streams front end **152** and the decoder **162** are instructions executable by the processor **235** to provide the functionality described below with reference to FIGS. **6-8**. In still another embodiment, one or more of the document activity collector **352**, the calendar activity collector **354**, the social network activity collector **356**, the other source activity collector **358**, the encoder **164**, the activity streams backend **154**, the activity streams front end **152** and the decoder **162** are stored in the memory **237** of the customization system **103** and are accessible and executable by the processor **235**.

Methods

FIG. **4** is a sequence diagram of a preview action of the extraction pipeline **202** according to some embodiments of the present disclosure. FIG. **4** shows the operations performed by the extraction pipeline **202** and its interaction with the client device **115** and the activity source **160**. FIG. **4** illustrates merely one example operation; however, it can be understood how the other operations are performed by the extraction pipeline **202** in response to input about an activity stream from the client device **115** or in response to the activity information from an activity source **160**. Specifically, FIG. **4** illustrates the processing of input from a share box **402** displayed on the browser **150** of the client device **115** and modifications to the appearance of that share box **402** in response to the receipt of additional activity information by the extraction pipeline **202**. The process begins with the display of the share box **402** at the client device **115**. The user interacts with the share box **402** and inputs a user supplied URL **404** into the share box **402**. The user also selects a share button (not shown) from the user interface displayed by the client device **115**. This causes the client device **115** to send **406** the user supplied URL **404** to the customization system **103**, in particular the extraction pipeline **202**. In some embodiments, the client device **115** also sends **406** other information such as the type of the client device **115**. For example, the client device **115** may identify itself as being a desktop browser or a browser on a mobile device. In some embodiments, both the type of post or activity and the type of client are determined at the time the post is created. For example, there may be a specific field such as update metadata.namespace enumr field to specify the type of post or activity and the type of client. The user supplied URL **404** is received at the extraction pipeline **202**, and a link preview action **408** is initiated. In some embodiments, the link preview action **408** creates a stream application processed by the extraction pipeline **202**. Processing of the link preview action **408** causes a request (e.g., an HTTP request) to be sent **410** from the extraction pipeline **202** to the activity source **160** corresponding to the user supplied URL **404**. The activity source **160** corresponding to the user supplied URL **404** processes **412** the HTTP request and generates a response, such as an HTML page. The response, HTML, is sent **414** from the activity source **160** to the extraction pipeline **202**. The extraction pipeline **202** creates **416** a protocol buffer (proto) based upon the type of activity or post and/or the type of client from the response received from the activity source **160**. For example, the extraction pipeline **202** creates a generic schema.org protocol buffer (proto) **418** by processing the HTML from the activity source **160**, and parses the formatted metadata in the header of the page. One example of the components of a generic protocol buffer is described at http://schema.org. In some embodiments, the generic protocol buffer is stored by the extraction pipeline **202** for later use. Next, the extraction pipeline **202** adds **420** embedded code to create a type-specific protocol buffer (proto) **422**. For example, the embed converter **214** processes the generic schema.org protocol buffer **418** and then converts it to a type-specific protocol buffer **422** on the server based upon the activity type and client type. For example, the embedded code can include Java, protocol buffers, JavaScript, server and client-side support, rendering template, custom style sheets, GSS, other templates and information. In some embodiments, the type-specific protocol buffer **422** is stored by the extraction pipeline **202** for later use. The type-specific protocol buffer **422** is then sent **424** from the extraction pipeline **202** to the client device **115**. The client device **115** processes the type-specific protocol buffer **422** to generate the type specific template **428** that is shown by the browser (not shown) in the update preview template **426**. FIG. **4** illustrates a path for information to pass from the activity source **160** to the client device **115** through the extraction pipeline **202**. In this path, the information is received by the extraction pipeline **202**, converted to a generic protocol buffer and then modified into a type-specific protocol buffer (using activity type and client type as an index to a library of embedded code) that is sent to the client device **115**. The architecture of the present disclosure is advantageous because this two-step conversion process can be utilized for any information that is sent from the activity source **160** to the client device **115** by using the data type taxonomy **218** and the library **210** of embedded code. It should be recognized that any action or information can be sent from the activity source **160** to the client device **115** in a similar manner.

FIG. **5** is a sequence diagram of a share operation of the extraction pipeline **202** according to some embodiments of the present disclosure. FIG. **5** shows the actions performed by the extraction pipeline **202** in a sharing operation and its interaction with the client device **115** and the activity source **160**. More generally, FIG. **5** illustrates a process for sending information from the client device **115** to the activity source **160**. A sharing operation begins with the display of a share box **402** by the client device **115**. The sharing operation may also be initiated by other APIs or other code. The user inputs information that he or she would like to share (Share information **502**) within the share box **402**. The user selects a share operation such as by selecting a button associated with the share box **402**. This causes the client device **115** to send **504** the share information **502** in the share box **402** to the extraction pipeline **202**. For example, the client device **115** may send an XML HTTP request to the extraction pipeline **202**. In some embodiments, the client device **115** generates a type-specific protocol buffer that is sent **504** to the extraction pipeline **202**. The extraction pipeline **202** initiates **506** a post action. The extraction pipeline **202** generates **508** (or extracts from the XML HTTP request) a type-specific protocol buffer (proto) **510**. Next, the extraction pipeline **202** converts **512** the type-specific protocol buffer **510** to a generic protocol buffer **514**. The extraction pipeline **202** then sends **516** the generic protocol buffer (proto) **514** to the activity source **160**, and the activity source **160** creates **518** an activity. The architecture of the present disclosure is advantageous because this two-step conversion process can be utilized for any information that is sent from the client device **115** to the activity source **160** by using the embed converter **214**. It should be recognized that the sharing action is used merely as an example, and action or information can be sent from the client device **115** to the activity source **160** in a similar manner.

Referring now to FIG. **6**, a method **600** for storing and rendering custom posts in the activity stream is described. The method **600** begins by receiving **602** activity information and an activity type. In some embodiments, a client type is also retrieved or received. In some embodiments, the activity streams backend **154** receives this information from the activity sources **160**. In other embodiments, the activity streams backend **154** receives the activity information from the activity sources **160** and determines the activity type and the client type. Next, the method **600** continues by encoding **604** the information from block **402** and storing it at the activity streams backend **154**. In some embodiments, the data is immediately sent to the activity streams front end **152**. It should be recognized that the activity streams backend **154** repeatedly performs the above process for posts received from the activity sources **160**. While the present disclosure will be described in FIGS. **6**, **7** and **8** in the context of posts, it will be appreciated that the same process of typing, encoding and decoding can be applied to any type of activity information that is displayable to the user **120** on the client device **115**. The method continues at the activity streams front end **152** where the encoded data is received or retrieved **606** from the activity streams backend **154**. The activity streams front end **152** decodes **608** the encoded data to produce the activity information and the activity type. Based upon the activity type and the client type, the activity streams front end **152** retrieves **610** a custom template and JavaScript from the custom template storage **156**. The activity streams front end **152** then sends **612** the activity information, the custom template and the script to the client device **115**. Finally, the method **600** completes with the client device **115** rendering **614** a custom post using the activity information, the custom template and the script.

Referring now to FIG. **7**, some embodiments of a method **700** for storing activity information and an activity type (and/or a client type) in an activity streams backend **154** is described. The method **700** begins by receiving **702** data or activity information from one or more of the activity sources **160** at the activity streams backend **154**. In some embodiments, the activity information is a custom protocol buffer or data map with associations between data and fields. In some embodiments, the same custom protocol buffer is used for activity information. The data may also include a client type. Then the method **700** determines **704** an activity type associated with the received information. In some embodiments, the activity type is provided by the activity sources **160**. In other embodiments, the activity streams backend **154** selects an activity type for the activity information based upon one or more of the source of the activity information, the content of the act of information, the functionality associated with the activity information, and the format for displaying the activity information. In some embodiments, there are a number of predefined activity types with associated formatting, functionality, data fields and JavaScript or JavaScript classes. Either the custom template or associated script for the activity type has already been stored in the custom template storage **156** at some time prior, or optionally, the activity streams backend **154** receives the custom template and associated script from the activity sources **160** and stores **706** them in the custom template storage **156**. Then the method **700** encodes or serializes **708** the activity information and the activity type into encoded data. In some embodiments, the data is scrubbed **710**. In particular when the activity streams backend **154** stores information from a plurality of unrelated third-party sources, the data is scrubbed for security purposes. Finally, the encoded/serialized data is stored in the activity database **360** of the activity streams backend **154**. In another embodiment, the encoded/serialized data is stored **712** to a location accessible by both the activity streams backend **154** and the activity streams front end **152**. In yet another embodiment, the encoder/serialized data is sent **712** to the activity streams front end **152**.

Referring now to FIG. **8**, some embodiments of a method **800** for rendering custom posts in the activity stream will be described. The method **800** begins by retrieving **802** encoded data from the activity streams backend **154**. The encoded data is de-serialized **804** to produce the activity information and an activity type. In some embodiments, the activity information and the activity type are in the form of a custom protocol buffer (proto) with defined fields and corresponding data for those fields. In particular, it should be noted that one of the fields that identifies the activity type is a namespace view. Next, the method **800** sends **806** the activity information and the activity type to the client device **115**. In some embodiments, the activity streams front end **152** does this by sending the custom protocol buffer (proto) to the client device **115**. Next, either the client device **115** or the activity streams front end **152** extracts **808** the namespace field value from the custom protocol buffer. The value in the namespace field and the client type are used **810** to identify which custom template, custom styling and associated JavaScript to retrieve from the custom template storage **156**. For each namespace value, there may be numerous different custom templates, custom styling and associated JavaScript according to the client type. Then the client device **115** or the activity streams front end **152** retrieves **812** the custom template and custom styling from the custom template storage **156** and installs them with associated JavaScript for interactivity. Finally the method **800** completes by populating **814** the custom template with data and presents it on the display of the client device **115**.

In the above description, for purposes of explanation, numerous specific details are set forth in order to provide a thorough understanding of the disclosure. It will be apparent, however, that the disclosure can be practiced without these specific details. In other instances, structures and devices are shown in block diagram form in order to avoid obscuring the disclosure. Moreover, the present disclosure is described below primarily in the context of a social network; however, it should be understood that the present disclosure applies to any type of communication and can be used to present posts or any type of communication.

Reference in the specification to "one embodiment," "an embodiment," "some embodiments" or "other embodiments" means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present disclosure. The appearances of the phrase "in one embodiment," "some embodiments" or "other embodiments" in various places in the specification are not necessarily all referring to the same embodiment.

Some portions of the detailed descriptions that follow are presented in terms of algorithms and symbolic representations of operations on data bits within a computer memory. These algorithmic descriptions and representations are the means used by those in the data processing arts to most effectively convey the substance of their work to others. An algorithm is here, and generally, conceived to be a self consistent sequence of steps leading to a desired result. The steps are those requiring physical manipulations of physical quantities. Usually, though not necessarily, these quantities take the form of electrical or magnetic signals capable of being stored, transferred, combined, compared, and otherwise manipulated. It has proven convenient at times, principally for reasons of common usage, to refer to these signals as bits, values, elements, symbols, characters, terms, numbers or the like.

It should be borne in mind, however, that all of these and similar terms are to be associated with the appropriate physical quantities and are merely convenient labels applied to these quantities. Unless specifically stated otherwise as apparent from the following discussion, it is appreciated that throughout the description, discussions utilizing terms such as "processing" or "computing" or "calculating" or "determining" or "displaying" or the like, refer to the action and processes of a computer system, or similar electronic computing device, that manipulates and transforms data represented as physical (electronic) quantities within the computer system's registers and memories into other data similarly represented as physical quantities within the computer system memories or registers or other such information storage, transmission or display devices.

The present disclosure also relates to an apparatus for performing the operations herein. This apparatus may be specially constructed for the required purposes, or it may comprise a general-purpose computer selectively activated or reconfigured by a computer program stored in the computer. Such a computer program may be stored in a computer readable storage medium, such as, but is not limited to, any type of disk including floppy disks, optical disks, CD-ROMs, and magnetic disks, read-only memories (ROMs), random access memories (RAMs), EPROMs, EEPROMs, magnetic or optical cards, flash memories including USB keys with non-volatile memory or any type of media suitable for storing electronic instructions, each coupled to a computer system bus.

The disclosure can take the form of an entirely hardware embodiment, an entirely software embodiment or an embodiment containing both hardware and software elements. In a preferred embodiment, the disclosure is implemented in software, which includes but is not limited to firmware, resident software, microcode, etc.

Furthermore, the disclosure can take the form of a computer program product accessible from a computer-usable or computer-readable medium providing program code for use by or in connection with a computer or any instruction execution system. For the purposes of this description, a computer-usable or computer-readable medium can be any apparatus that can include, store, communicate, propagate, or transport the program for use by or in connection with the instruction execution system, apparatus, or device.

A data processing system suitable for storing and/or executing program code will include at least one processor coupled directly or indirectly to memory elements through a system bus. The memory elements can include local memory employed during actual execution of the program code, bulk storage, and cache memories which provide temporary storage of at least some program code in order to reduce the number of times code must be retrieved from bulk storage during execution.

Input/output or I/O devices (including but not limited to keyboards, displays, pointing devices, etc.) can be coupled to the system either directly or through intervening I/O controllers.

Network adapters may also be coupled to the system to enable the data processing system to become coupled to other data processing systems or remote printers or storage devices through intervening private or public networks. Modems, cable modems and Ethernet cards are just a few of the currently available types of network adapters.

Finally, the algorithms and displays presented herein are not inherently related to any particular computer or other apparatus. Various general-purpose systems may be used with programs in accordance with the teachings herein, or it may prove convenient to construct more specialized apparatus to perform the required method steps. The required structure for a variety of these systems will appear from the description below. In addition, the present disclosure is not described with reference to any particular programming language. It will be appreciated that a variety of programming languages may be used to implement the teachings of the disclosure as described herein.

The foregoing description of the embodiments of the present disclosure has been presented for the purposes of illustration and description. It is not intended to be exhaustive or to limit the present disclosure to the precise form disclosed. Many modifications and variations are possible in light of the above teaching. It is intended that the scope of the present disclosure be limited not by this detailed description, but rather by the claims of this application. As will be understood by those familiar with the art, the present disclosure may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. Likewise, the particular naming and division of the modules, routines, features, attributes, methodologies and other aspects are not mandatory, and the mechanisms that implement the present disclosure or its features may have different names, divisions and/or formats. Furthermore, as will be apparent to one of ordinary skill in the relevant art, the modules, routines, features, attributes, methodologies and other aspects of the present disclosure can be implemented as software, hardware, firmware or any combination of the three. Also, wherever a component, an example of which is a module, of the present disclosure is implemented as software, the component can be implemented as a standalone program, as part of a larger program, as a plurality of separate programs, as a statically or dynamically linked library, as a kernel loadable module, as a device driver, and/or in every and any other way known now or in the future to those of ordinary skill in the art of computer programming. Additionally, the present disclosure is in no way limited to implementation in any specific programming language, or for any specific operating system or environment. Accordingly, the disclosure of the present disclosure is intended to be illustrative, but not limiting, of the scope of the present disclosure, which is set forth in the following claims.

What is claimed is:

1. A computer-implemented method for processing posts in activity streams, comprising:

receiving, with one or more computing devices, a client type specifying a type of a client device;

receiving, with the one or more computing devices, activity information from an activity source;

receiving, with the one or more computing devices, an activity type;

creating, with the one or more computing devices, a first protocol buffer using the activity type and the activity information;

selecting, with the one or more computing devices, embedded code from a library of embedded code based in part upon the client type and the activity type;

adding, with the one or more computing devices, the embedded code to the first protocol buffer to create a second protocol buffer; and

sending, with the one or more computing devices, the second protocol buffer for rendering of the activity information.

2. The method of claim **1** further comprising storing, with the one or more computing devices, the first protocol buffer at an extraction pipeline.

3. The method of claim **1** wherein creating the first protocol buffer also uses the client type to determine the first protocol buffer.

4. The method of claim **1** wherein the first protocol buffer is a generic schema.org protocol buffer.

5. The method of claim **1** further comprising storing, with the one or more computing devices, the second protocol buffer at an extraction pipeline.

6. The method of claim **1** wherein the second protocol buffer is a type-specific protocol buffer.

7. The method of claim **1** wherein the embedded code includes a type-specific protocol buffer, Java, JavaScript, one or more custom templates, and custom styling.

8. The method of claim **1** wherein the first protocol buffer is a serialization format with an interface description language.

9. A computer program product comprising a non-transitory computer usable medium including a computer readable program, wherein the computer readable program when executed on a computer causes the computer to:

receive a client type specifying a type of a client device;

receive activity information from an activity source;

receive an activity type;

create a first protocol buffer using the activity type and the activity information;

select embedded code from a library of embedded code based in part upon the client type and the activity type;

add the embedded code to the first protocol buffer to create a second protocol buffer; and

send the second protocol buffer for rendering of the activity information.

10. The computer program product of claim **9**, wherein the computer readable program when executed on the computer also causes the computer to store the first protocol buffer at an extraction pipeline.

11. The computer program product of claim **9**, wherein the client type is used to determine the first protocol buffer.

12. The computer program product of claim **9**, wherein the first protocol buffer is a generic schema.org protocol buffer.

13. The computer program product of claim **9**, wherein the computer readable program when executed on the computer also causes the computer to store the second protocol buffer at an extraction pipeline.

14. The computer program product of claim **9**, wherein the second protocol buffer is a type-specific protocol buffer.

15. The computer program product of claim **9**, wherein the embedded code includes a type-specific protocol buffer, Java, JavaScript, one or more custom templates, and custom styling.

16. The computer program product of claim **9**, wherein the first protocol buffer is a serialization format with an interface description language.

17. A computer-implemented method for processing posts in an activity stream, executing on one or more computing devices, the method comprising:

receiving, with the one or more computing devices, a client type specifying a type of a client device;

receiving, with the one or more computing devices, an activity type;

receiving, with the one or more computing devices, activity information from the client device;

creating, with the one or more computing devices, a type-specific protocol buffer based in part upon the client type and the activity type;

select embedded code from a library of embedded code based in part upon the client type and the activity type:

converting, with the one or more computing devices, the type-specific protocol buffer to a generic protocol buffer using the selected embedded code; and

sending, with the one or more computing devices, the generic protocol buffer to an activity source, the activity source being different from the client device.

18. The method of claim **17** wherein the activity type is a post of information.

19. The method of claim **17** wherein the generic protocol buffer is a generic schema.org protocol buffer.

20. A system for processing posts in an activity stream, the system comprising:

one or more processors;

the one or more processors being configured to:

receive a client type specifying a type of a client device;

receive activity information from an activity source;

receive an activity type;

create a first protocol buffer using the activity type and the activity information;

select embedded code from a library of embedded code based in part upon the client type and the activity type;

add the embedded code to the first protocol buffer to create a type-specific protocol buffer; and

send the type-specific protocol buffer to the client device for rendering of the activity information.

21. The system of claim **20**, wherein the activity source is one or more from a group of a social network server, a third party server, a micro-blogging server, a profile server, a SMS/MMS server, an IM server, a search server and a web server.

22. The system of claim **20**, wherein the embedded code includes an associated script, and a data map with associations between data and fields.

23. The system of claim **20**, wherein the embedded code is retrieved from a library of embedded code, and the library of embedded code includes a plurality of customized embedded codes, each of the customized embedded codes for processing information related to a specific activity type.

24. The system of claim **20**, wherein the one or more processors are further configured to communicate with the activity source and provide activity information to a data type taxonomy.

25. The system of claim **20**, wherein the one or more processors are further configured to communicate with the client device and determine the client type.

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